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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/623,448	07/18/2003	Shigeo Kittaka	1018.1177101	4005
28075	7590	10/20/2004	EXAMINER	
CROMPTON, SEAGER & TUFTE, LLC 1221 NICOLLET AVENUE SUITE 800 MINNEAPOLIS, MN 55403-2420			KIANNI, KAVEH C	
			ART UNIT	PAPER NUMBER
			2883	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/623,448

Applicant(s)

KITAKA ET AL.

Examiner

K. Cyrus Kianni

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 23 is/are rejected.
- 7) ☒ Claim(s) 2-22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1 Claims 2-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 2 is allowable because the prior art of record, taken alone or in combination, fails to disclose or render obvious $2 = \frac{1}{\omega} \left| \frac{\Delta \omega}{\omega_0} \right|$ in combination with the rest of the limitations of the base claim.

Claim 3 is allowable because the prior art of record, taken alone or in combination, fails to disclose or render obvious wherein the photonic crystal includes a periodic direction and said at least either one of the input medium and the output medium comprising the photonic crystal, includes end surfaces perpendicular to the periodic direction of the photonic crystal as an input surface and an output surface, the photonic crystal includes a photonic band gap and a photonic band in the vicinity of the photonic band gap, and the electromagnetic waves entering the input surface are propagated by the photonic band in combination with the rest of the limitations of the base claim.

Claims 4-8 are allowable because the prior art of record, taken alone or in combination, fails to disclose or render obvious wherein the photonic crystal includes end surfaces from which the periodic characteristic is exposed as an input surface and an output surface, a photonic band structure having a line, which is either a Brillouin zone boundary line or a central line, and a photonic band, and light waves entering the input surface are propagated by one of the photonic band, which exists on the Brillouin

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zone boundary line of the photonic band structure or in the vicinity of the Brillouin zone boundary line; and the photonic band, which exists on the central line of the photonic band structure or in the vicinity of the central line in combination with the rest of the limitations of the base claim.

Claims 9-16 are allowable because the prior art of record, taken alone or in combination, fails to disclose or render obvious wherein the photonic crystal has an end surface, which includes a reflective diffraction grating that comprises said diffraction grating, and when electromagnetic waves including plural frequency components are input to the photonic crystal, the reflective diffraction grating produces diffracted wave for each of the plural frequency components of the electromagnetic wave in different directions in combination with the rest of the limitations of the base claim.

Claims 7-22 are allowable because the prior art of record, taken alone or in combination, fails to disclose or render obvious an array waveguide diffraction grating including an input slab waveguide connected to the input waveguide, an output slab waveguide connected to output waveguide, and an arrayed waveguide connected between the two slab waveguides and generating an optical path length difference, with the arrayed waveguide comprised of the photonic crystal as the diffraction grating that periodically divides electromagnetic waves and produces a phase difference in the wave fronts of the divided electromagnetic waves in combination with the rest of the limitations of the base claim.

Claim Rejections - 35 USC § 103

2- The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

- This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US 2001/0012149).

Regarding claims 1 and 23, Lin teaches a diffraction device for periodically dividing an electromagnetic wave (shown in at least figures 7 and 15), the diffraction device comprising:

a diffraction grating (see figures 7c, item diffraction grating; see parag. 0125);
an input medium contacting the diffraction grating (see fig. 7c, input/output medium made of glass/crystal contacting the grating; also the surrounding medium—air—analogue to applicant's invention can also be considered as input/output medium);
and an output medium contacting the diffraction grating (see fig. 7c, input/output

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medium made of glass/crystal/air contacting the grating), with at least either one of the input medium and output medium comprising a photonic crystal having a periodic characteristic in single direction (see fig. 7, item crystal 708/709 having periodic characteristic in single direction); wherein the photonic crystal comprises a multilayer body 708/709 having different refractive indices are superimposed in periods that are about the same as the wavelength of light (shown in fig. 7c; see parag. 0088).

However, in above embodiment Lin does not specifically teach wherein or the diffraction grating comprising a photonic crystal, which periodically divides electromagnetic waves to produce a phase difference in a wave front with differences in optical propagation distances between the divided electromagnetic waves; and wherein the above multiplayer body made of dielectric bodies. Nevertheless the above limitations are taught by Lin in other embodiment(s) (see fig. 15, item grating producing a phase difference in a wave front with differences in optical propagation distances; see parag. 0088 for photonic crystals—bodies—made of dielectric material). Thus, it would have been obvious to those of ordinary skill in the art when the invention was made to combine different embodiments of Lin's teachings in order to produce an optical device having the above limitation since such embodiments are compatible with each other and since the resultant optical device would produce EM wave having wavelengths from microwave to uv (see parag. 00002).

Citation of Relevant Prior Art

4. Prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In accordance with MPEP 707.05 the following references are pertinent in rejection of this application since they provide substantially the same information disclosure as this patent does. These references are:

Parker et al. 6735368 teaches at least claim 1

Sidorin et al. 2003/0214700 teaches at least claim 1

Charlton et al. WO 98/53351

Miller et al. 6591035

Sekine et al. 20010026659

These references are cited herein to show the relevance of the apparatus/methods taught within these references as prior art.

Contact Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to K. Cyrus Kianni whose telephone number is (571) 272-2417.

The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 6:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font, can be reached at (571) 272-2415.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 872-9306 (for formal communications intended for entry)

or:

Hand delivered responses should be brought to Crystal Plaza 4, 2021 South Clark Place, Arlington, VA., Fourth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956.



K. Cyrus Kianni
Patent Examiner
Group Art Unit 2883

October 14, 2004